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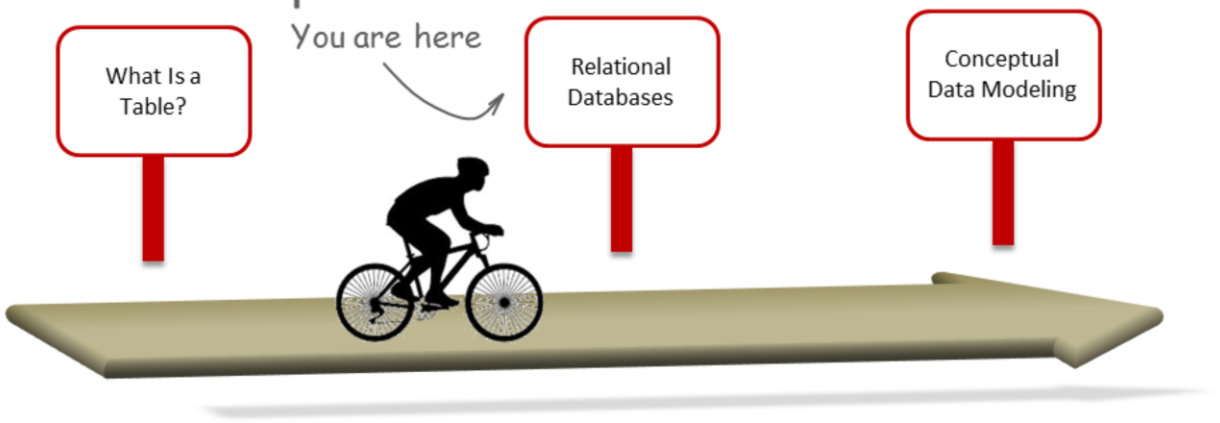
Updates:

# Database Foundations

## 2-2
## Relational Databases

ORACLE ACADEMY

# Roadmap




Data Modeling Terminology

Unique Identifiers and Primary Keys

Relationships and Foreign Keys

# Objectives

This lesson covers the following objectives:

- Describe the features of a relational database
- Describe the advantages of a relational (multiple-table) database
- Define the relational tables and the key terms

# Relational Databases

- A relational database presents information in tables with rows and columns.
- Each column represents a particular type of information (a field), and each row lists one record.
- The tables are then related to one another by using foreign keys.
- A foreign key is simply the primary key in a different table.

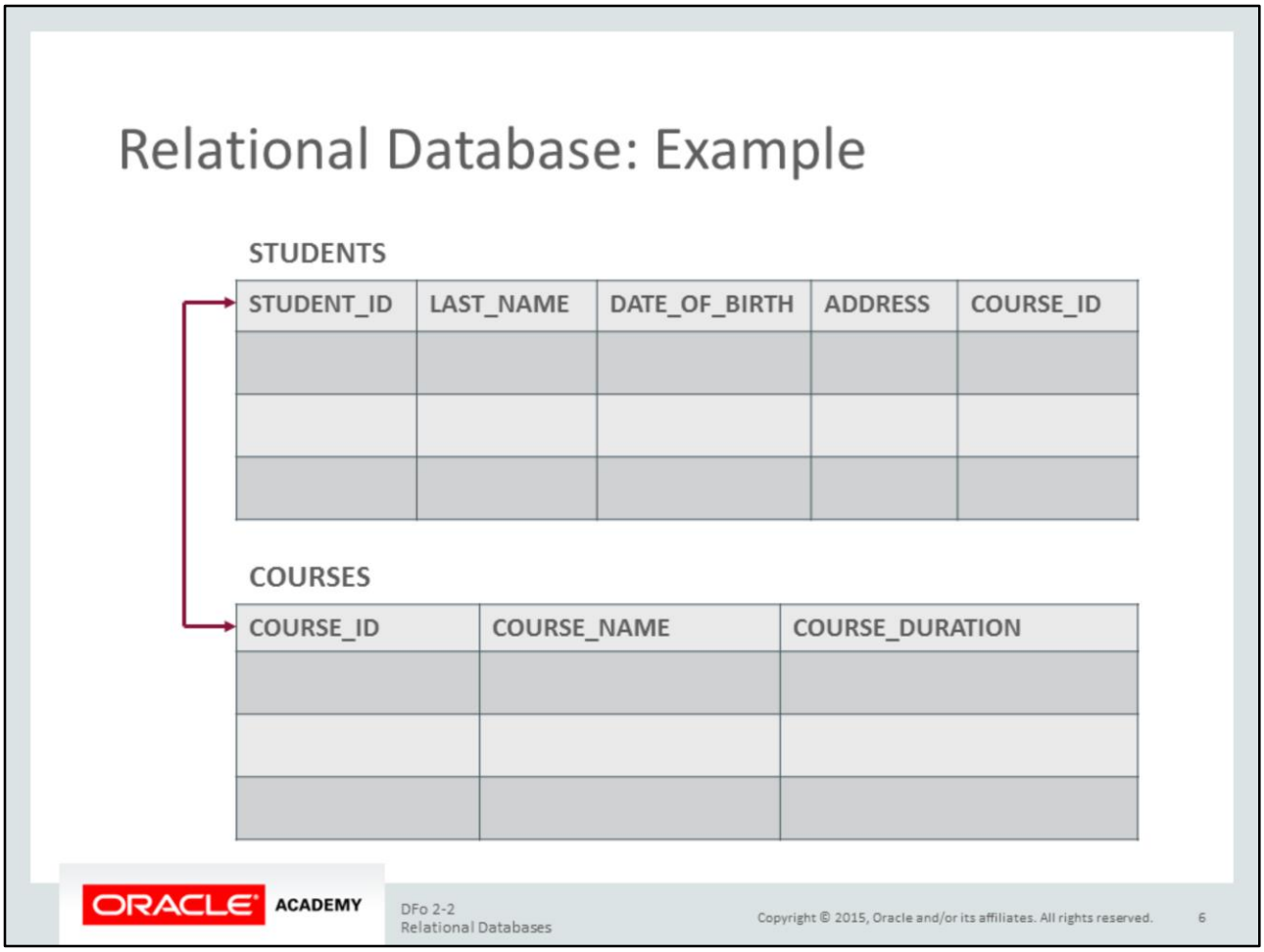




A relational database management system (RDBMS) stores data in tables. Each table is given a name by the user who creates the table. The user generally chooses a name that correlates to the data that will be stored in the table; for example, `STUDENTS`, `EMPLOYEES`, `LOCATIONS`. When a table is created, the user also creates and names columns related to the specific characteristics that are stored for each record.

To understand how important databases have become in today's world, consider the following statistics:

- Currently 20% of the world's data resides in RDBMSs.
- In the next two years, databases are expected to grow larger than 100 terabytes. A database this big would be able to store 100,000 copies of the *Encyclopedia Britannica* or 200,000 hours of music or about 10 billion webpages.
- Some of the top 10 world's largest databases using the Oracle RDBMS are:
  - France Telecom, 29.2TB: a communications company (a TB is a terabyte equivalent to 1,000 gigabytes)
  - Amazon.com, 13 TB: an online company selling books and merchandise
  - The Claria Corporation,12TB: an Internet behavioral marketing company tracking Internet user behavior

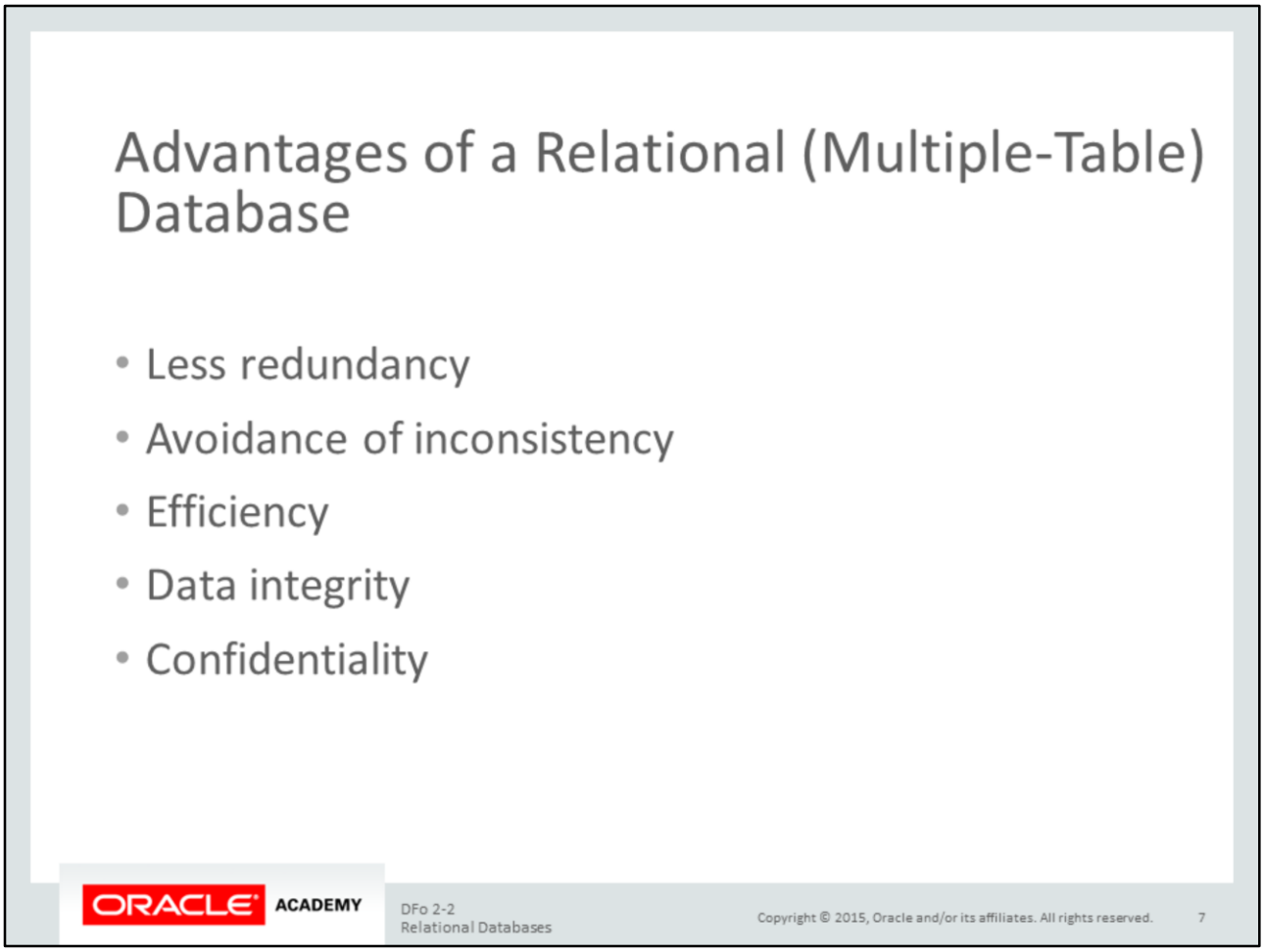



If you were saving data in the `STUDENTS` table, you may include columns that are named `STUDENT_ID`, `LAST_NAME`, `DATE_OF_BIRTH`, and `ADDRESS`. One column is designated as the `PRIMARY_KEY` column, which means that, for each record entered into this database, the column identified as the `PRIMARY_KEY` cannot contain duplicate values. In a `STUDENTS` table, it would be logical to designate the `STUDENT_ID` column as the `PRIMARY_KEY`, because each student's identification number is unique.

The `PRIMARY_KEY` column plays a key role in relating, or linking, the tables. A `PRIMARY_KEY` column in one table is designated as a `FOREIGN_KEY` column in a related table.

A row is created when data that you want to store is entered into the table. A row is one record. For example, if you entered data about a student into the `STUDENTS` table, the row will contain the student's identification number, last name, date of birth, and address.

A relational database has multiple tables. Following the example with `STUDENTS`, you will likely have a table that is linked to it, and it contains all data about the courses. Students may take many courses, and this relationship between the `STUDENTS` table and the `COURSES` table lets you store the data and query it to determine the specific courses that a student is attending (or has attended).

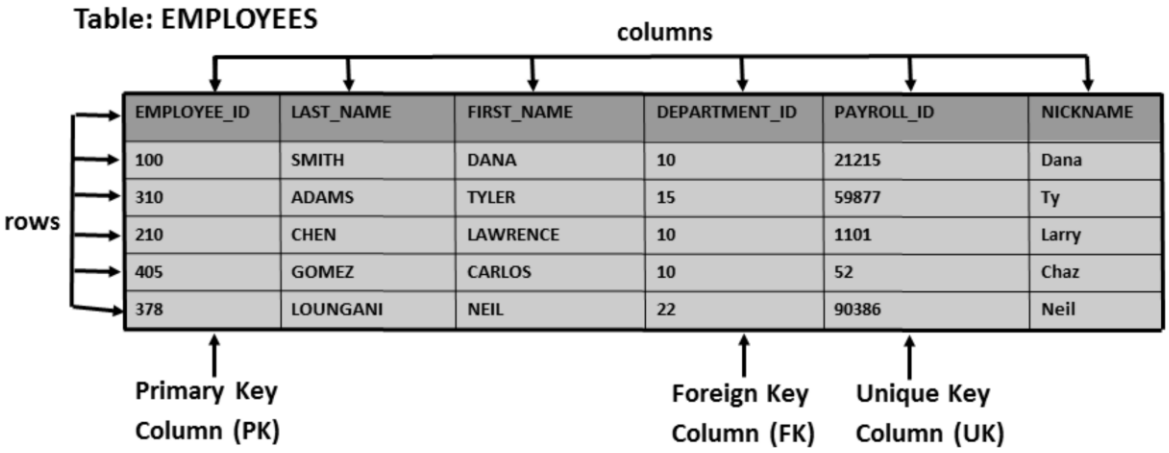



Compared to the flat file system, the RDBMS has several advantages:

- **Less redundancy:** In a flat file system, there is much redundancy. For example, the names of university professors and students are stored in more than one file.
- **Avoidance of inconsistency :** If the same piece of information is stored in more than one place, then any changes in the data need to be made in all places where the data is stored.
- **Efficiency:** A database is usually more efficient than a flat file system, because a piece of information is stored in fewer locations.
- **Data integrity**: In a database system, it is easier to maintain data integrity because strong data types are assigned to each column.
- **Confidentiality:** It is easier to maintain the confidentiality of the information if data storage is centralized in one location.

# Relational Tables

- A table is a simple structure where data is organized and stored.



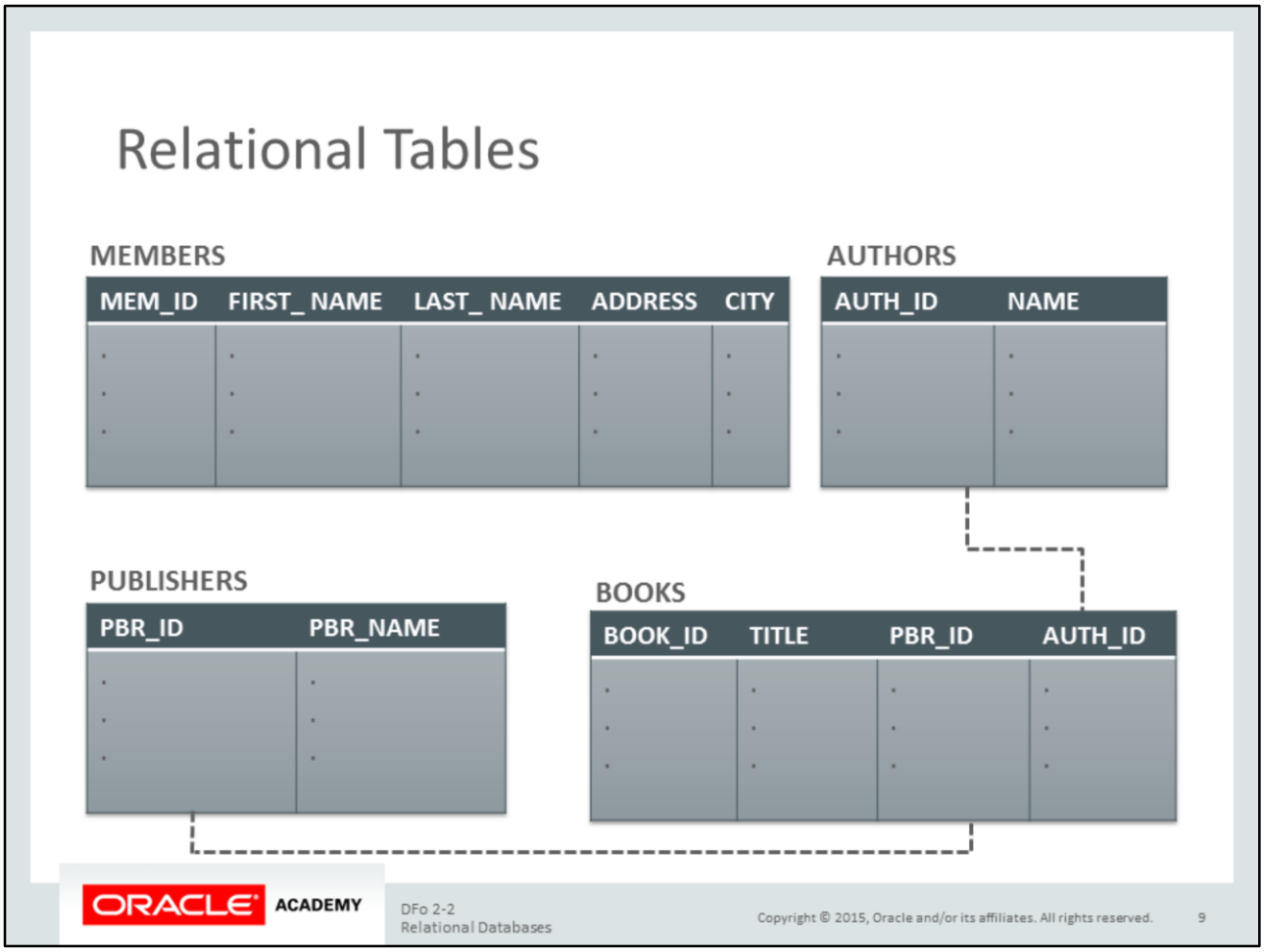




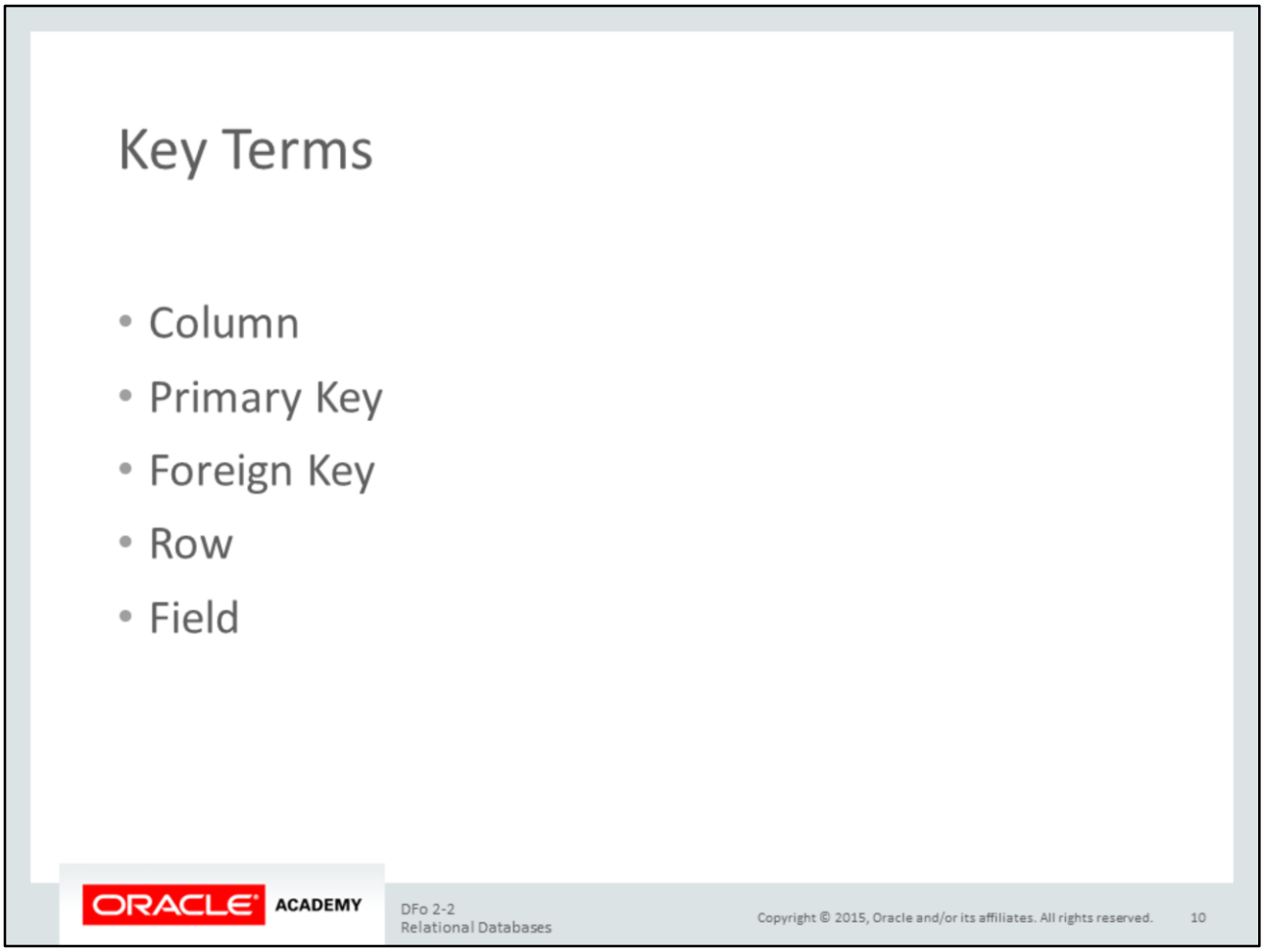

Tables have columns and rows. In the slide example, the `EMPLOYEES` table stores employee information. Each row describes an occurrence of an employee. Each column is used to store a specific type of value, such as employee number, last name, and first name.

The `EMPLOYEE_ID` column is a primary key. Every employee has a unique identification number. The value in the primary key column distinguishes each individual row. The `PAYROLL_ID` column is a unique key. This means that the system does not allow two rows with the same `payroll_id`.

The foreign key column refers to a row in another table. In this example, the `department_id` refers to a row in the `DEPARTMENTS` table. You know that Dana Smith works in department 10. If you wanted to know more about Dana Smith's department, you would look for the `department_id = 10` row in the `DEPARTMENTS` table.




This slide example a relational tables that represent a simplified library database.




Let's review the following key terms:

- **Table:** A basic storage structure
- **Column:** An attribute that describes the information in the table
- **Primary Key:** The unique identifier for each row
- **Foreign Key:** A column that refers to a primary key column in another table
- **Row:** Data for one table instance
- **Field:** The one value found at the intersection of a row and a column

# Properties of Tables

A relational database has six table properties:

- **Property 1:** Entries in columns are single values.
- **Property 2:** Entries in columns are of the same kind.
- **Property 3:** Each row is unique.
- **Property 4:** Order of columns is insignificant.
- **Property 5:** Order of rows is insignificant.
- **Property 6:** Each column has a unique name.





The slide shows the table properties in a relational database.

# Summary

In this lesson, you should have learned how to:

- Describe the features of a relational database
- Describe the advantages of a relational (multiple-table) database
- Define the relational tables and the key terms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